

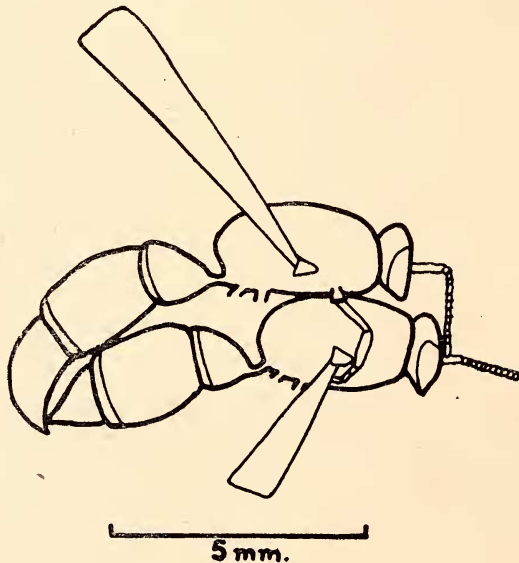
## 10. SEXUAL BEHAVIOUR IN SOLITARY EUMENID WASPS

(With two text-figures)

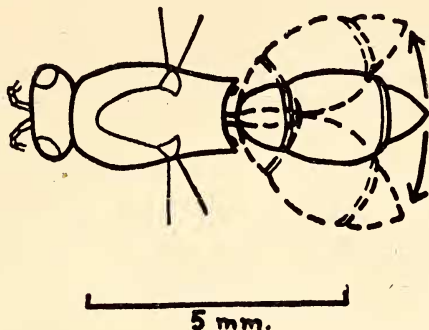
Wasps of *Stenodynerus miniatus* (Sauss.) build mud tubes on walls. The similar squatter wasps of the species *Subancistrocerus sichelii* (Saussure) exploit both natural cavities and mud cells built by other wasps. In Thailand, Iwata (1964) found them in cells of a species now classified as belonging to *Stenodynerus* by J. Van der Vecht and Jayakar & Spurway (1966) have perhaps found it in cells of *S. miniatus* itself. They have been observed resting in hollow bamboos, and nest boxes which are provided.

On four occasions apparent mating has been seen. On 23 August 1963, this was observed on cells of the *Stenodynerus* sp. built between 18 May and 3 June, 1963 from which no specimens were collected. As no wasps were seen on this nest between 22 June and 19 August, it is conceivable that the wasps seen on 23 August belonged to *Subancistrocerus sichelii* (but see Jayakar & Spurway 1966). These also were not captured. On 6/10 and 7/10/64 the wasps observed had emerged from the nest boxes and were preserved, while on 13/8/65 it was performed by two wasps who were certainly *Stenodynerus miniatus*.

On 23 August, when first seen at 09.24 a.m., one wasp was riding the other, as in Fig. 1. At 09.29, the ♂ (assumed to be the one on top) started fluttering his wings. Their genitalia then made



contact for about 3 secs., then separated. The male then started moving his abdomen rhythmically sideways through an arc of about  $60^\circ$  (Fig. 2). With each sideways movement, he stroked with his abdomen the tip of the female's abdomen (see Fig. 1), and at



the same time, fluttered his wings and tapped the female's head with both his antennae. At 09.30, the fluttering of the wings alone discontinued. At 09.35, though the abdominal movements continued, the antennal movements stopped. Abdominal movements ceased at 09.37. From 09.38 to 09.42, the female walked about. The cycle was repeated several times and the times are given below. (The movements were roughly 3 beats to a second.)

- 09:45 .. contact of genitalia and fluttering by female—start of rhythmic abdominal, antennal and wing movements ;
- 09:46 .. wing movements stopped ;
- 09:50 .. antennal movements stopped ;
- 09:53 .. abdominal movements stopped—♂ fluttered with his antennae held vertically down.
- 10:02 .. contact of genitalia—rhythmic movements of abdomen, genitalia and wings started ;
- 10:03 .. wing movements stopped ;
- 10:05 .. ♂ fluttered briefly ;
- 10:07 .. antennal movements stopped ;
- 10:10 .. ♀ moved, ♂ fluttered ;
- 10:11 .. abdominal movements stopped.
- 10:12-10:13 .. — ♂ fluttered several times while ♀ walked about.
- 10:20 .. contact of genitalia—rhythmic abdominal, antennal and wing movements started ;
- 10:23 .. wing movements stopped ;
- 10:27 .. antennal movements stopped—♂ flutters ;
- 10:29 .. disturbance by a mosquito flying near them—abdominal movements stopped—♀ moving about, ♂ fluttering occasionally.
- 10:37 .. contact of genitalia with ♂ fluttering—rhythmic movements started ;
- 10:39 .. wing movements stopped ;
- 10:43 .. antennal movements stopped ;
- 10:44 .. ♂ flutters while ♀ walks about ;

- 10:45 .. abdominal movements stopped.  
 10:46 .. ♂ flutters while ♀ walks about.  
           At 10:52, another wasp of the same species came out of one  
           of the cells, was approached by the copulating pair, and withdrew.  
 10:55 .. contact of genitalia—rhythmic movements started ;  
 10:57 .. wing movements stopped ;  
 10:59 .. ♂ flutters several times ;  
 11:01 .. ♀ moves—antennal movements stopped—some fluttering ;  
 11:02 .. abdominal movements stopped—♀ moved—♂ fluttered ;  
 11:10 .. contact of genitalia—rhythmic movements started ;  
 11:14 .. wing movements stopped ;  
 11:15 .. ♂ fluttered.

At 11.15, the wasp from the cell emerged and re-entered twice, causing the copulating female to walk off the nest onto the wall. The male then dismounted and flew away, and at 11.16, the female flew away. Table 1 summarises these data.

TABLE 1

Cycle	Period				
	A	B	C	Total	D
1	1	5	2	8	8
2	1	4	3	8	9
3	1	4	4	9	9
4	3	4	2	9	8
5	2	4	2	8	10
6	2	4	1	7	8
7	4	—	—	—	—
Mean	2.0	4.2	2.3	8.2	8.7

A=Beginning of rhythmic movements to stopping of wing movements.

B=Stopping of wing movements to stopping of antennal movements.

C=Stopping of antennal movements to stopping of abdominal movements.

D=Stopping of abdominal movements to beginning of next cycle (i.e. of A).

On 6/10/64, two wasps emerged from nest box 4, cell III (called 4. III). These cells were sealed by wasp *S.s.* 7 on 11/9/64 in the house of my colleagues R. Mangipudi and H. Pulugurtha in Bhubaneswar. The cell (width 3/16", length 1½", volume 0.442 cc.) had been partitioned by the mother into two sub-cells. The nest box was put into a covered glass jar to trap the emergences, and the wasps, when first seen at 10.28 a.m., were one on top of the other as described before. At 10.34, 10.43 and 10.51, rhythmic movements similar to those described above were performed by the male, who

dismounted at 11.04. On the next day, of 3 emergences from cell 4.IX (the same size as 4.III), the male was riding one of the females at 12.10 p.m. and dismounted at 12.20. In the latter two cases, no contact of the genitalia was observed, and it is possible that the wasps had been disturbed enough to alter their behaviour.

The nest on which similar mating behaviour was seen on 13/8/65 was built by a female of *Stenodynerus miniatus* (Jayakar & Spurway 1966). The nest was started on 20/7/65, and by 13/8, she had completed the building of three cells, two of which were sealed. At 09.09, a pair was seen copulating on the nest, and there was an emergence hole in the mouth of tube I. The male was performing the abdominal movements described above. Very soon after, the male dismounted; the female then went to the mouth of cell I, then pecked at the ♂, who flew away. At 09.14, the female was captured, etherised, marked, and then released. Her subsequent history has been published (Jayakar & Spurway op. cit.).

No similar behaviour has been seen in any other species of wasp observed here, though mounting and riding have been observed in *Eumenes emarginatus conoideus* (Gmelin). The latter were deliberately put together in a jar. It is interesting that the wasps considered in this paper copulated immediately after emergence, and that there is thus a high probability of brother-sister mating and possibly son-mother mating. Iwata (1953) has seen copulations in *Eumenes decoratus* Smith and *E. fraterculus* Dalla Torre, and he has also seen males visiting places where females collected mud, and this suggests that females at least sometimes copulate after they have started building.

I am grateful to Dr. van der Vecht of Leiden for determining the species of the offspring of the female marked on 13/8/65 and of another individual from the relevant nest box, probably also the offspring of S.s. 7, and to Dr. K. Iwata of Hyogo for criticising a draft of this paper.

GENETICS AND BIOMETRY LABORATORY,

BHUBANESWAR 3,

ORISSA,

August 23, 1965.

S. D. JAYAKAR

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